

Montana Department of Transportation  
Research Programs  
November 2006

**EXPERIMENTAL PROJECT**

**EVALUATION OF RADAR SPEED DISPLAY (RSD) TRAILER-MOUNTED DEVICE  
FOR SPEED REDUCTION FOR USE IN CONSTRUCTION WORK ZONES**

**Location:** Interstate 90, Approximate Mile-point 304; Butte District,  
Gallatin County.

**Project Name:** Bear Canyon

**Project Number:** IM 90-6(90)304, UPN 3612

**Type of Project:** Experimental trial of automated radar speed display  
(RSD's) trailers for use in potential speed reduction in a  
construction work zone

**Principal Investigators:** Craig Abernathy, Experimental Project Manager  
Doug Bailey, Designer-Traffic Engineering Section

**Objective**

Determine the effectiveness of trailer mounted radar speed display devices in reducing speeds in  
The Bear Canyon construction work zone.

**Experimental Design**

Deployment of two SunRay 115R radar speed display trailers at two locations on the Bear  
Canyon project, Interstate 90 (I-90).

**Evaluation Procedures**

Evaluation will consist of collecting data with automatic traffic recorders (ATR) to determine if  
the devices are a factor in speed reductions. Research worked with the Departments Traffic  
Engineering Section in the coordination and scheduling of the data collection process.  
ATR data will be collected at evenly spaced distances throughout the work zone crossover

(figure 1). ATR speed data will be collected prior to initiating the RSD's to provide base data comparison. The MDT Traffic Engineering section was responsible in determining the necessary frequency and duration of speed data collection to present a statistically defensible performance evaluation. The average length of the work zone is five miles.

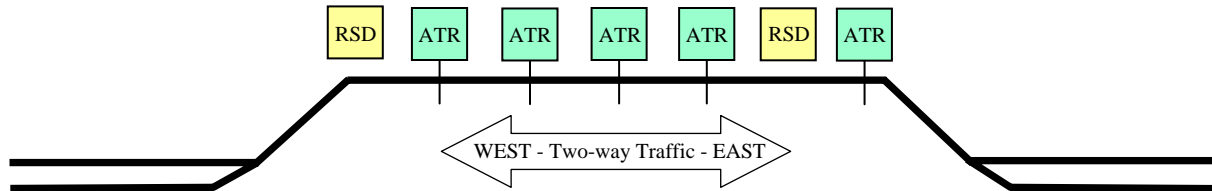


Figure 1: Representative Diagram of the I-90 Work Zone Crossover Schematic of Approximate Placement of the RSD Units and ATR's

### Initial Analysis

Prior to the placement of the RSD's, travel speeds were sampled directional over a 24-hour period on May 3 & 4. The trailers were put into operation on May 31. Another 24-hour directional speed sample was collected on June 7<sup>th</sup>. Posted speed limit through the main corridor of the work zone was 45 miles-per-hour (MPH). A speed of 35 mph was posted at each merge site of the work-zones. ATR data was collected approximately at mileposts 314, 315, 316, 317, 318, respectively.

Average travel speed (ATS), as determined by the 85<sup>th</sup> percentile speed data; in the eastbound lanes prior to the placement of the RSD's was 49 mph, average speed after the installation of the RSD's was at 47 mph (rounded to the nearest MPH).

Average travel speed in the westbound lanes prior to the placement of the RSD's was 55 mph, average travel speed after the installation of the RSD's was 52 mph. Table 1 shows the breakout of the 85<sup>th</sup> Percentile speeds at the five ATR placements.

Table 1 – 85<sup>th</sup> Percentile Speeds

Before Speeds Without Radar Trailer	After Speeds With Radar Trailer	Eastbound Speed Limit	Before Speeds Without Radar Trailer	After Speeds With Radar Trailer	Westbound Speed Limit
45	43	35	52	51	35
49	47	45	55	51	45
48	48	45	56	54	45
50	48	45	57	50	45
51	51	45	56	54	45

The difference of increase of speed of the westbound over the eastbound direction may be due to

the geometrics of the work-zone travel lanes. The westbound lanes had the advantage of a full lane and shoulder width, whereas there was jersey rail located adjacent to the eastbound travel lane (refer to figure 2). The speed data revealed that the traveling public was exceeding the posted speed limit by an average of six mph; however, the placement of the RSD's did drop the ATS by 2-3 mph.

Research did a sampling on two visits to the site and recorded the speed of vehicles as they approached the RSD's. The sampling was of one hundred vehicles at the eastbound and westbound locations in the months of August and October. One sampling was taken approximately at 10-11am and the other at 3-4pm. On average vehicles exceeding the 35 mph posted limit on the eastbound lane was 58%. Vehicles exceeding the 45 mph posted on the westbound lane limit were 64%. The difference of speeds may be due to the placement of the RSD's. The eastbound placement was at the junction of the eastbound lane merge to two-lane traffic (figure 3). The westbound location was some distance past the four-to-two-lane merge in the 45 mph zone. Drivers going westbound had more time to acclimate to the two-lane condition, which may explain the increase of speed. Care was taken that no one traveling through areas could see a state vehicle or a person near the RSD's while recording the count.

In addition Research traveled five trips on each direction through the work zone following the average platoon speed. The eastbound direction averaged 48 mph, the westbound averaged 53 mph. There was one instance in the westbound direction where a driver maintained a constant 45 mph through the entire work zone queuing up to thirty vehicles behind it. As the platoon reached the end of the work-zone and merged back into the two-lane westbound direction there was a rapid shuffling of vehicles attempting to break out of the pack and past the restrictive driver. From the researchers point of view it seemed to be a short but precarious situation.

Drivers tend to travel as fast as they feel comfortable, absent the threat of enforcement. Even in areas posted as work zones with reduced speed limits, if there are no indications that active work is taking place and the road maintains a normal cross-section, drivers may maintain a higher travel speed, regardless of the posted work zone speed limit. For this situation on a bridge deck replacement project, the traveling public is not subjected to an on-going work zone as other types of construction projects may exhibit (e.g. a reconstruct). The limited, noticeable work activity may have led to an overall increase over the posted speed limit.

Current research from other states into the effectiveness of RSD's has shown favorable results used on construction projects. However there are numerous variables that may affect their overall effectiveness; the level of enforcement, the type of construction, the efficiency of the channelizing of the work zone site, and socioeconomics factors.

Anecdotal information from MDT staff and from the Project Manager Rick Johnson feels they have seen a positive difference in the behavior of drivers traveling through the project. There have also been power supply issues with these units needing to be taken out and recharged. Due to the area they are in they may not be getting the daily solar load needed to function continually. Note that these particular RSD's have built-in ATR's and a central processing unit (CPU) with traffic analysis software for rudimentary on-site traffic analysis. They also have the capacity to

generate a 4-digit, alpha-numeric display to drivers who are exceeding the set speed limit. Messages such as 'slow down' or 'too fast' or 'be safe' can be flashed at the driver. Due to initial software problems the ATR feature was not used on this project. The problem has been corrected and can be used in future applications.

Research suggests that these units be used in other work zones of differing construction types to ascertain their overall efficiency. If the Department feels that more formal research may be required to reach a consensus of effectiveness we could easily contract through the MPARTS program with one of the state's universities to develop and capture a more structured data method and subsequent analysis and recommendations.

